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ABSTRACT

This paper presents the results of a study of the output of Canadian universities as measured by graduate degrees conferred or by graduates produced. The study was conducted to answer 2 basic questions: (1) Do Quebec universities train enough qualified manpower in comparison with the other provinces? and (2) Encouraged by funds and by the Quebec government policy of catching-up, do the French universities reach the output of the English universities in the province? It was found that Ontario and the Western Provinces have been ahead of Quebec in the graduate degrees/labor force ratio for several years. In Quebec itself, the French universities produce more master's degrees than the English universities, but McGill surpasses all of the French universities in the output of doctorates. As for the catching-up policy set for the French universities, it seems that they have not yet attained the breadth of research and scientific training that doctoral level programs should include. (Author/HS)

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THE OUTPUT OF CANADIAN UNIVERSITIES AS MEASURED BY GRADUATE DEGREES

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Presented at the Annual Meeting of the Canadian Learned Societies, Montreal, Q., May 29, 1972.

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The Output of Canadian Universities As Measured by Graduate Degrees

Higher education in Canada has seen an increase in student enrolments at an annual rate of ten to fifteen per cent during the past decade. In addition, the rate of expenditure for this level of education has vastly surpassed the rate of personal income, making higher education a major industry.[1] It has been estimated that activities related to universities and colleges in Canada now account for about five per cent of aggregate national economic activity.[2] This fact has lead us to study the output of Canadian universities, as measured by graduate degrees conferred or by graduates produced, the latter representing a stock of human capital of benefit to the different provinces.

Aim of the Study

This paper presents the results of a study on the output of universities. The aim of the study was to determine a common unit of graduate degrees granted per province in proportion to the labor force, that is, to compare the graduate degrees/labor force ratios (1) between Quebec and the other provinces and (2) between the French-language and the English-language universities in Quebec.

The Problem

The problem is formulated as follows: (1) Do Quebec universities train enough qualified manpower in comparison with the other provinces? Encouraged by funds and by the Quebec government policy of catching-up

(la politique de rattrapage), did the French universities reach the output of the English universities in the province?

Conceptual Framework

The output of universities is linked with qualified labor requirements. The present unbalanced cycle of demand for and supply of professional manpower should lead the universities to diversify their programs of study and adjust to the rapidly changing labor market and social conditions. Of course, no one doubts the need for the qualified training offered by universities. In its First Annual Report, the Economic Council of Canada emphasized that the availability of highly qualified manpower will be a very important factor in reaching economic objectives in years to come.[3] Between 1956 and 1963, Canada granted only one doctorate degree for every thirty-three conferred in the United States, even in proportion to their respective populations. And despite the increase in student enrolments in humanities and in social sciences these last years, not one doctorate was granted in Fine Arts, Library Sciences, or Physical Education in Canada until 1969; further, not one Ph.D. in Economics was awarded in the French universities in Quebec until 1970-71, even with the catching-up policy. It is thus at the graduate level of studies that the question of training highly qualified manpower becomes critical.

Graduate schools are engaged in two major throughput activities: instruction and research. The latter produces more knowledge and at the same time makes a better use of the already existing knowledge. Since it

is difficult to quantify the amount of research done in a university (the sum of money invested in research during a certain period can be documented or the ratio of publications to faculty members can be fixed, but that is not enough to measure this throughput), this study assumes that there is no graduate school worthy of the name without some research activity. Hence, the university output on the master's level and particularly on the doctoral level implies research activity and applied scientific training.

This study limits itself to the graduate level for the following reasons:

1. Significant differences do not seem to exist among Canadian universities in the offering and output of bachelor degree programs. The annual registrations in universities have increased during the last decade, and student enrolment projections for the years to come show a continuation of that increase.[4] The decrease in birthrate observed in most of the provinces will probably be neutralized by the growing request for university instruction. It every seens that the disparities in taking university studies between sons of well-to-do families and those not as well off have decreased.[5]
2. A fact that strikes a higher education analyst is that the importance once given to first university degrees is reserved today for graduate degrees. In a good number of professions, the first university degree holders are considered only as technicians, and a master's is the minimum requirement for reaching a more important position.
3. It is at the graduate level that we can perceive differences in the university teaching and research activities and in the diversification of

programs based on technological innovations. The training of highly qualified manpower is subject to this type of scientific diversification.

Do a master's of 1960 and one of 1970 reflect the same quality? This is a difficult question, and no ready answer suggests itself. Nonetheless, a certain logic implies that a degree granted in 1970 would be of higher quality than one awarded in 1960 if only because of the increased quality of the input and the improvement of the throughput (better trained teachers, improved teaching methods, the use of technological innovations, the accumulation of more knowledge by research) during this period. In any case, it seems that the quality of instruction is changing, and so are the individual and social benefits that derive from the formation of human capital. These things not being quantifiable, to assume a constant average quality of the student body by discipline seems reasonable.[6] Thus, the study does not carry a judgment on the value of the degrees granted.

Method

The period covered is 1960-61 to 1969-70, which was the period of expansion of higher education in Canada. University degrees were examined as a whole without differentiating between men and women, even though certain graduates, especially women, will work part time or may not join the force at all. The data on graduates and the labor force were taken from annual publications of the Dominion Bureau of Statistics (D.B.S.), although for the interpretation of degrees granted in Quebec, statistics from the French universities were considered.[7]

In order to establish a relation with the structure of professions that are found in the labor market, a distinction was made between Education, the Humanities, the Arts, and part of Social Sciences on one hand and the Biological Sciences, Engineering, Mathematics, Physics, and the Health Professions on the other. Degrees in Economics, Administration, Urbanism, and Planning, although being part of the Social Sciences, were added to the applied sciences. This differentiation is in line with the new standardized classification used by the D.B.S., which presents the statistics by disciplines and professions rather than by universities and subdivision in Arts and Sciences. In other words, a distinction was made between "economic" graduates (those who by their integration in the labor force will contribute to the economic growth of the country) and the "cultural" or the "humanities" graduates (those who will participate only indirectly in the economic development). This distinction affects the breakdown of the student body holding a master's degree only, because very few graduates in Canada received a Ph.D. in economics or in the administrative sciences during the period studied.

Since 1968-69, "licences" have been included in the undergraduate level as equivalent to a bachelor's degree. The French universities have joined the other North American universities by granding B.A., M.A., and Ph.D.'s. The "licences" that follow a degree in the same field of study are considered equivalent to a master's. In order to do justice to the teaching activities in the French universities, this study considers the "licences" as being above the bachelor's during the period in which they were counted in the master's.

Honorary doctorates are excluded, as are doctorate in dentistry and medicine, the latter being a first professional degree. Also excluded in this study are the diplomas and certificates awarded for courses of study sanctioned by a diploma or certificate, since their programs of study differ from those leading to a degree. While acknowledging that the Ph.D. is not the only quality indicator and that there are other titles than the doctorate degree in certain university disciplines and fields of study, the present study examined the M.A., M.Ed., M.Sc., Ed.D. and Ph.D. degrees only.

In order to determine a composite output measure or a common unit of degrees granted per province, a weighting index is calculated for the different university degrees, based on the years of schooling required for each degree. Hence, the weight of 0.7 units is calculated for a "licence" (seventeen years of schooling), 0.8 units is counted for a master's (eighteen years of schooling) and one unit is calculated for a doctorate (twenty years of schooling).[9] The summation gives us a yearly total of units of degrees granted or of graduates produced per year in Canada as a whole, and also per province and regional groupings.

Table 1 and 2 (in the Appendix) present data on degrees granted by Canadian universities. The Atlantic Provinces (New Brunswick, Newfoundland, Nova Scotia, Prince Edward Island), Quebec, Ontario, and the Western Provinces (Alberta, British Columbia, Manitoba, Saskatchewan) form geographical or regional units, facilitating the comparison. This subdivision is also used

in the publications of the D.B.S. Table 3 presents totals of the active labor for the month of October of each year. The annual list of graduates includes the graduating classes of May and October; thus, for statistical reasons, the active labor force report for the month of October of each year seems the best to use.

Data Analysis

"Licences" were awarded by the French universities in the province of Quebec and a number of them by the bilingual University of Ottawa. As mentioned beforehand, the decrease in number in 1968-69 is attributed to the fact that the "licences" were included at the undergraduate level as equivalent to a bachelor's degree and that the programs of study were restructured in view of the master's. Most "licences" were awarded in the humanities. The turning point was 1965-66, when 1,101 "licences" were granted in Quebec, as compared to 680 the preceding year. Probably, this was the result of the university carching-up policy brought forth in the early 1960's. The fact that the master's replaced the "licence" can be seen in 1969-70, when 1,834 masters were conferred, as against 1,373 in 1968-69.

In the country as a whole, the number of degrees granted in the humanities increased each year (see Table 2, column Canada). From 1,381 master's awarded in 1960-61, the number grew to 4,820 in 1969-70; the number of degrees in sciences increased from 1,398 in 1960-61 to 5,016 in 1969-70.

On the basis of graduate degrees/labor force ratios (see Table 3), it seems since 1968-69 that Ontario has surpassed the other provinces or groups of provinces in the output of graduates, although Quebec came first until 1967-68. In October 1970, the ratios were 1.308 units of graduates per thousand members of the labor force in Ontario, 0.849 units in the Western Provinces, 0.740 in Quebec, and 0.578 in the Atlantic Provinces. Quebec is even behind the Western Provinces; the effort of the latter in higher education seems to have increased significantly.

It might be that the compilation of "licences" at the undergraduate level decreases the number of graduate degrees for Quebec in 1968-69 and 1969-70. However, if we take a look at the number of units for Ontario and for the Western Provinces, we can see the following: the progress in Ontario dates to 1966-67, before "licences" were considered as equivalent to a bachelor's. As to the Western Provinces, from 1967-68 their output in doctorates has been higher than that in Quebec; these provinces progressed from 1968-69 to 1969-70 by thirty-two per cent.

In point two of the present study, we will compare the French and English universities of the province of Quebec. In the output of master's, the French universities drew ahead of the English universities during the whole period. The situation is different in the output of doctorates. Here McGill University surpasses the French universities put together (see Table 4). Between 1960-61 and 1969-70, McGill granted 1,123 doctorates, while the French universities awarded only 687. Especially in sciences McGill surpasses by far the other universities in the province.

It granted 916 doctorates, while Laval University, the University of Montreal, and the University of Sherbrooke awarded all together 334 doctorates, or seventy-three per cent by McGill and twenty-seven per cent by the French universities.

Summary and Conclusions

Ontario and the Western Provinces have been ahead of Quebec in the graduate degrees/labor force ratio these past few years. As for the comparison in Quebec itself, the French universities produce now more master's than the English ones, but McGill surpasses the French universities put together in the output of doctorates.

Now, if we return to the principle noted beforehand, that the output of graduates, and particularly of doctorates, implies research activity and applied scientific training, Ontario and the Western Provinces surpass Quebec in the training of a highly qualified manpower needed for economic growth. One can say that Ontario is becoming the university research center of Canada.

With regard to Quebec, it seems that a good number of Ph.D.'s from McGill do not integrate in the economy of the province. Is this because of the graduate student population composition of that university (a significant number is made of foreign or out-of-the-province students), or is it by the nature of circumstances (the French fact in Quebec)? If this is so, the problem of training a highly qualified manpower for this province becomes even more serious.

As for the catching-up policy set for the French universities, it seems that the latter have not yet attained the breadth of research and scientific training that doctoral level programs should include.

References

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2. Slater, D.W., "Economics of Universities and Colleges." Notes for Presentation to the Meetings of the Canadian Economic Association, Winnipeg, 4 June, 1970. Queen's University, Kingston, Canada, 32 pp. Mimeographed, cited in W. Hettich, Expenditures, Output and Productivity in Canadian University Education. Special Study No. 14, Economic Council of Canada. Ottawa: Information Canada, 1971, p. 3.

3. Economic Council of Canada, First Annual Review: Economic Goals for Canada to 1970. Ottawa: Information Canada, 1964, pp. 163-65.

4. Zsigmond, Z.E. & C.J. Wenaas, Enrolment in Educational Institutions, by Province, 1951-52 to 1980-81. Economic Council of Canada, Study No. 25. Ottawa: Information Canada, 1970, p. 13.

5. "Ontario Studies Accessibility," University Affairs (Ottawa), 1970, Vol. XI (9), p. 16.

6. Hettich, op. cit., p. 60, asserts that applying adjustments to the measure of output, that is, to the quality of the student body requires the same adjustments to the earnings forgone, which comes to the same.

7. Survey of Higher Education, D.B.S., Cat. 81-211, Part II, Degrees and Summary, 1959-61 to 1968-69; Degrees, Diplomas, Certificates Awarded by Degree-Granting Institutions 1969-70, Cat. 81-211; Université Laval, "Statistiques des diplômés de l'Université Laval," 1960-61 to 1967-68 (mimeographed); Statistiques 1969-70 and 1970-71; Université de Sherbrooke, Statistiques 1967-68 to 1970-71; Université de Montréal, Statistiques 1967-68 to 1970-71.

8. D.B.S., Degrees, Diplomas, . . ., p. 101 Zsigmond & Wenaas, pp. 275-76.

9. The Quebec teachers'collective agreement for 1967-68 mentions in an Appendix the recognition of degrees granted by different Canadian, North American, and French degree-granting institutions in terms of school years; see also University Affairs, 1969, Vol. X (8), pp. 16-17.

10. D.B.S., The Labor Force, Cat. 71-001, October 1961 to October 1970.

A P P E N D I X

Table 1*

Graduate Level Degrees Granted by Canadian Universities

		Atlantic Provinces						Quebec						Ontario		
Year	D.	Hum.	Sc.	Total	W.	U.D.	T.U.	Hum.	Sc.	Total	W.	U.D.	T.U.	Hum.	Sc.	Total
1960	L.	-	-	-		-		301	62	363	0.7	254		59	-	59
-61	M.	68	38	106	0.8	85		288	381	669	0.8	535		401	428	829
	D.	-	3	3	1	3	88	39	84	123	1	123	912	56	89	145
	L.	-	-	-		-		453	88	541	0.7	379		83	-	83
1961	M.	57	37	94	0.8	75		307	370	677	0.8	542		452	481	933
-62	D.	-	8	8	1	8	83	35	71	106	1	106	1027	47	97	144
	L.	-	-	-		-		460	103	563	0.7	394		32	-	32
1962	M.	75	65	140	0.8	112		330	430	760	0.8	608		510	536	1046
-63	D.	-	3	3	1	3	115	33	93	126	1	126	1128	62	122	184
	L.	-	-	-		-		444	103	547	0.7	383		62	-	62
1963	M.	86	89	175	0.8	140		344	401	745	0.8	596		626	624	1250
-64	D.	1	5	6	1	6	146	46	112	158	1	158	1137	65	125	190
	L.	-	-	-		-		569	111	680	0.7	476		55	-	55
1964	M.	107	101	208	0.8	166		288	525	813	0.8	650		778	752	1530
-65	D.	-	14	14	1	14	180	54	121	175	1	175	1301	80	147	227
	L.	-	-	-		-		1031	70	1101	0.7	771		38	-	38
1965	M.	120	99	219	0.8	175		294	694	988	0.8	790		908	970	1878
-66	D.	2	15	17	1	17	192	47	124	171	1	171	1732	109	207	316
	L.	-	-	-		-		1180	72	1252	0.7	876		53	-	53
1966	M.	130	106	236	0.8	189		453	766	1219	0.8	975		1213	1195	2408
-67	D.	1	22	23	1	23	212	80	147	227	1	227	2078	103	230	333
	L.	-	-	-		-		1412	278	1690	0.7	1183		3	-	3
1967	M.	160	146	306	0.8	245		660	612	1272	0.8	1018		1376	1377	2753
-68	D.	3	18	21	1	21	266	69	160	229	1	229	2430	164	321	485
	L.	-	-	-		-		193	254	447	0.7	313		5	-	5
1968	M.	162	190	352	0.8	282		633	740	1373	0.8	1099		1693	1570	3263
-69	D.	1	36	37	1	37	319	79	157	236	1	236	1648	164	340	504
	L.	-	-	-		-		-	-	-		-		-	-	-
1969	M.	240	185	425	0.8	340		962	872	1834	0.8	1467		2277	2050	4327
-70	D.	4	42	46	1	46	386	79	181	260	1	260	1727	137	503	640

* Continued

Abbreviations

D. = Degree
L. = Licence
M. = Master
D. = Doctorate

Hum. = Humanities
Sc. = Sciences
W. = Weighting index
U.D. = Units of Degrees

T.U. = Total Units

Table 2*

Graduate Level Degrees Granted by Canadian Universities

		Ontario			Western Provinces						Canada					
Year	D.	W.	U.D.	T.U.	Hum.	Sc.	Total	W.	U.D.	T.U.	Hum.	Sc.	Total	W.	U.D.	T.U.
	L.	0.7	41		-	-	-		-		360	62	422	0.7	295	
1960	M.	0.8	663		167	281	448	0.8	358		924	1128	2052	0.8	1642	
-61	D.	1	145	849	2	32	34	1	34	392	97	208	305	1	305	2242
	L.	0.7	58		-	-	-		-		536	88	624	0.7	437	
1961	M.	0.8	745		201	312	513	0.8	410		1017	1200	2217	0.8	1773	
-62	D.	1	144	947	9	54	63	1	63	473	91	230	321	1	321	2531
	L.	0.7	22		-	-	-		-		492	103	595	0.7	417	
1962	M.	0.8	837		270	356	626	0.8	501		1185	1387	2572	0.8	2058	
-63	D.	1	184	1043	5	102	107	1	107	608	100	320	420	1	420	2895
	L.	0.7	43		-	-	-		-		506	103	609	0.7	426	
1963	M.	0.8	1000		367	364	731	0.8	585		1423	1478	2901	0.8	2321	
-64	D.	1	190	1233	4	127	131	1	131	716	116	369	485	1	485	3232
	L.	0.7	39		-	-	-		-		624	111	735	0.7	515	
1964	M.	0.8	1224		418	397	815	0.8	652		1591	1775	3366	0.8	2693	
-65	D.	1	227	1490	13	140	153	1	153	805	147	422	569	1	569	3777
	L.	0.7	27		-	-	-		-		1069	70	1139	0.7	797	
1965	M.	0.8	1503		464	547	1011	0.8	809		1786	2310	4096	0.8	3277	
-66	D.	1	316	1846	23	170	193	1	193	1002	181	516	697	1	697	4771
	L.	0.7	37		-	-	-		-		1233	72	1305	0.7	914	
1966	M.	0.8	1927		579	506	1085	0.8	868		2375	2573	4948	0.8	3958	
-67	D.	1	333	2297	25	180	205	1	205	1073	209	579	788	1	788	5660
	L.	0.7	2		4	-	4	0.7	3		1419	278	1697	0.7	1188	
1967	M.	0.8	2203		665	621	1286	0.8	1029		2861	2756	5617	0.8	4493	
-68	D.	1	485	2690	45	226	271	1	271	1303	281	725	1006	1	1006	6687
	L.	0.7	4		-	-	-		-		198	254	452	0.7	316	
1968	M.	0.8	2610		708	703	1411	0.8	1129		3196	3203	6399	0.8	5119	
-69	D.	1	504	3118	84	247	331	1	331	1460	328	780	1108	1	1108	6543
	L.		-		-	-	-		-		-	-	-		-	
1969	M.	0.8	3462		1022	853	1875	0.8	1500		4501	3960	8461	0.8	6769	
-70	D.	1	640	4102	99	330	429	1	429	1929	319	1056	1375	1	1375	8144

* Continued from Table 1

Abbreviations

D. = Degree
L. = Licence
M. = Master
D. = Doctorate

Hum. = Humanities
Sc. = Sciences
W. = Weighting index
U.D. = Units of Degrees

T.U. = Total Units

Table 3

Graduate Level Degrees/Labor Force Ratios

Year	Atlantic Prov.			Quebec			Ontario			Western Prov.			Canada		
	U.D. (1)	L.F. (2)	R. (1)/(2)	U.D. (1)	L.F. (2)	R. (1)/(2)	U.D. (1)	L.F. (2)	R. (1)/(2)	U.D. (1)	L.F. (2)	R. (1)/(2)	U.D. (1)	L.F. (2)	R. (1)/(2)
Oct. 1961	88	613	0.144	912	1812	0.503	849	2386	0.356	392	1727	0.227	2242	6538	0.343
Oct. 1962	83	608	0.137	1027	1839	0.558	947	2403	0.394	473	1759	0.269	2531	6609	0.383
Oct. 1963	115	613	0.188	1128	1930	0.584	1043	2487	0.419	608	1811	0.336	2895	6841	0.423
Oct. 1964	146	622	0.235	1137	1938	0.587	1233	2546	0.484	716	1856	0.386	3232	6962	0.464
Oct. 1965	180	625	0.288	1301	2040	0.638	1490	2596	0.574	805	1918	0.420	3777	7179	0.526
Oct. 1966	192	638	0.301	1732	2149	0.806	1846	2740	0.674	1002	1992	0.503	4771	7519	0.635
Oct. 1967	212	653	0.325	2078	2181	0.953	2297	2815	0.816	1073	2042	0.525	5660	7691	0.736
Oct. 1968	266	650	0.409	2430	2241	1.084	2690	2961	0.908	1303	2143	0.608	6687	7995	0.836
Oct. 1969	319	659	0.484	1648	2290	0.720	3118	3002	1.039	1460	2191	0.666	6543	8142	0.804
Oct. 1970	386	668	0.578	1727	2335	0.740	4102	3137	1.308	1929	2272	0.849	8144	8412	0.968

Abbreviations

Prov.= Provinces
U.D. = Units of Degrees
L.F. = Labor Force in thousands
R. = Ratios of column 1/column 2

Table 4

Earned Doctorates Granted by Quebec Universities

Year	McGill			Laval			U.of M.			M.D.C.			U. of Sh.			Quebec		
	H.	Sc.	T.	H.	Sc.	T.	H.	Sc.	T.	H.	Sc.	T.	H.	Sc.	T.	H.	Sc.	T.
1960-61	9	65	74	10	6	16	20	13	33	-	-	-	-	-	-	39	84	123
1961-62	16	54	70	4	3	7	15	14	29	-	-	-	-	-	-	35	71	106
1962-63	11	72	83	7	10	17	15	11	26	-	-	-	-	-	-	33	93	126
1963-64	18	87	105	9	9	18	19	16	35	-	-	-	-	-	-	46	112	158
1964-65	25	106	131	13	7	20	16	8	24	-	-	-	-	-	-	54	121	175
1965-66	18	88	106	16	17	33	13	19	32	-	-	-	-	-	-	47	124	171
1966-67	27	96	123	22	21	43	30	30	60	1	-	1	-	-	-	80	147	227
1967-68	29	130	159	16	12	28	24	17	41	-	-	-	-	1	1	69	160	229
1968-69	25	99	124	18	29	47	36	25	61	-	-	-	-	4	4	79	157	236
1969-70	29	119	148	20	26	46	30	32	62	-	-	-	-	4	4	79	181	260
Total	207	916	1123	135	140	275	218	185	403	1	-	1	-	9	9	561	1250	1811

Abbreviations

U. of M. = University of Montreal
M.D.C. = Montreal Diocese College
U. of Sh. = University of Sherbrooke

H. = Humanities
Sc. = Sciences
T. = Total